We claim:

1. A vehicle comprising:

first and second elongated spaced apart frame rails;

a front vehicle axle extending in a transverse direction relative to the frame rails, the front axle comprising first and second end portions;

a first suspension associated with the first end portion of the front axle and coupling the first end portion of the front axle to the first frame rail, the first suspension comprising a first leaf spring including a central portion overlying and pivotally coupled to the first end portion of the front axle for pivoting relative to the front axle about a first leaf spring pivot, the first leaf spring also including respective first forward and first rear leaf spring end portions coupled to the first frame rail, a first control rod having a first end portion pivotally coupled to the first end portion of the front axle for pivoting about a first pivot which is below the first leaf spring pivot, the first control rod having a second end portion pivotally coupled to the first frame rail for pivoting about a second pivot, and a second control rod having a first end portion pivotally coupled to the first end portion of the front axle for pivoting about a third pivot which is below the first pivot, the second end portion of the second control rod being pivotally coupled to the first frame rail for pivoting about a fourth pivot;

a second suspension associated with the second end portion of the front axle and coupling the second end portion of the front axle to the second frame rail, the second suspension comprising a second leaf spring including a central portion overlying and pivotally coupled to the second end portion of the front axle for pivoting relative to the front axle about a second leaf spring pivot, the second leaf spring also including respective second forward and second rear leaf spring end portions coupled to the second frame rail, a third control rod having a first end portion pivotally coupled to the second end portion of the front axle for pivoting about a fifth pivot which is below the second leaf spring pivot, the third control rod having a second end portion

pivotally coupled to the respective second frame rail for pivoting about a sixth pivot, and a fourth control rod having a first end portion pivotally coupled to the second end portion of the front axle for pivoting about a seventh pivot which is below the fifth pivot, the second end portion of the fourth control rod being pivotally coupled to the second frame rail for pivoting about an eighth pivot.

2. A vehicle according to claim 1 wherein the first and fifth pivots are above a front wheel axis about which wheels supported by the front axle rotate and the third and seventh pivots are below the front wheel axis.

3. A vehicle according to claim 1 wherein the first suspension comprises a first forward suspension bracket coupled to the first frame rail at a location forwardly of the front axle, the first forward suspension bracket extending downwardly from the first frame rail, and wherein the second and fourth pivots are carried by the first forward suspension bracket, and wherein the second suspension comprises a second forward suspension bracket coupled to the second frame rail at a location forwardly of the front axle, the second forward suspension bracket extending downwardly from the second frame rail, and wherein the sixth and eighth pivots are carried by the second forward suspension bracket.

4. A vehicle according to claim 1 wherein the first suspension comprises a first axle mounting bracket having a first pivot pin receiving bore which is positioned above the first end portion of the front axle when the first axle mounting bracket is mounted to the first end portion of the front axle, the first pin receiving bore defining a transversely extending first leaf spring pivot, and wherein the second suspension comprises a second axle mounting bracket having a second pivot pin receiving bore which is positioned above the second end portion of the front axle when the second

axle mounting bracket is mounted to the second end portion of the front axle, the second pin receiving bore defining a transversely extending second leaf spring pivot.

5. An apparatus according to claim 4 wherein the first axle mounting bracket comprises a first portion having a lower surface positioned at least in part over the first axle end portion and an upper surface supporting the first pivot pin receiving bore, the first axle mounting bracket also comprising first and second leg portions positioned forwardly of the front axle and carrying the first and third pivots; and

wherein the second axle mounting bracket comprises a first portion having a lower surface positioned at least in part over the second axle end portion and an upper surface supporting the second pivot pin receiving bore, the second axle mounting bracket also comprising first and second leg portions positioned forwardly of the front axle and carrying the fifth and seventh pivots.

6. An apparatus according to claim 5 wherein the first suspension comprises a first leaf spring clamp comprising a first member having respective spaced apart first and second sets of downwardly projecting partial bore defining projections and plural second members each defining a portion of a leaf spring pivot pin receiving bore, the second members being mounted to the first member such that together the first and second members define first and second spaced apart bore sections, the first pivot pin receiving bore being sized and positioned for insertion between the first and second bore sections, a first leaf spring pivot pin inserted through the first bore section, through the first pin receiving bore and through the second bore section to pivotally couple the first and second members to the front axle mounting bracket and thereby to the front axle, a third clamping member coupled to the first member with a portion of the central portion of the first leaf spring between the first and third members;

wherein the second suspension comprises a second leaf spring clamp comprising a fourth member having respective spaced apart first and second sets of downwardly projecting partial bore defining projections and plural fifth members each defining a portion of a leaf spring pivot pin receiving bore, the fifth members being mounted to the fourth member such that together the fourth and fifth members define third and fourth spaced apart bore sections, the second pin receiving bore being sized and positioned for insertion between the third and fourth bore sections, a second leaf spring pivot pin inserted through the third bore section, through the second pin receiving bore and through the fourth bore section to pivotally couple the fourth and fifth members to the second axle mounting bracket and thereby to the front axle, a sixth clamping member coupled to the fourth member with a portion of the central portion of the leaf spring between the fourth and sixth members.

7. An apparatus according to claim 1 wherein the vehicle comprises first and second tandem axles extending in a transverse direction relative to the frame rails, the front axle comprising the first axle of the tandem axles and the second axle comprising a rear axle of the tandem axles, the rear axle having first and second axle end portions;

a third suspension associated with the first end portion of the rear axle and coupling the first end portion of the rear axle to the first frame rail, the third suspension comprising a third leaf spring including a central portion overlying and pivotally coupled to the first end portion of the rear axle for pivoting relative to the rear axle about a third leaf spring pivot, the third leaf spring also including respective third forward and third rear leaf spring end portions coupled to the first frame rail, a fifth control rod having a first end portion pivotally coupled to the first end portion of the rear axle for pivoting about a ninth pivot which is below the third leaf spring pivot, the fifth control rod having a second end portion pivotally coupled to the first frame rail for pivoting about a tenth pivot, and a sixth control rod having a first end portion

pivotally coupled to the first end portion of the rear axle for pivoting about an eleventh pivot which is below the ninth pivot, the second end portion of the sixth control rod being pivotally coupled to the first frame rail for pivoting about a twelfth pivot;

a fourth suspension associated with the second end portion of the rear axle and coupling the second end portion of the rear axle to the second frame rail, the fourth suspension comprising a fourth leaf spring including a central portion overlying and pivotally coupled to the second end portion of the rear axle for pivoting relative to the rear axle about a fourth leaf spring pivot, the fourth leaf spring also including respective fourth forward and fourth rear leaf spring end portions coupled to the second frame rail, a seventh control rod having a first end portion pivotally coupled to the second end portion of the rear axle for pivoting about a thirteenth pivot which is below the fourth leaf spring pivot, the seventh control rod having a second end portion pivotally coupled to the respective second frame rail for pivoting about a fourteenth pivot, and an eighth control rod having a first end portion pivotally coupled to the second end portion of the rear axle for pivoting about a fifteenth pivot which is below the thirteenth pivot, the second end portion of the fourth control rod being pivotally coupled to the second frame rail for pivoting about a sixteenth pivot; and

wherein the first and second pivots are positioned in a first line and the third and fourth pivots are positioned in a second line parallel to the first line, the fifth and sixth pivots being positioned in a third line and the seventh and eighth pivots being positioned in a fourth line parallel to the third line, the ninth and tenth pivots being positioned in a fifth line and the eleventh and twelfth pivots being positioned in a sixth line parallel to the fifth line; and the thirteenth and fourteenth pivots being positioned in a seventh line and the fifteenth and sixteenth pivots being positioned in an eighth line parallel to the seventh line.

8. A vehicle according to claim 7 wherein the first and fifth pivots are above a front wheel axis about which wheels supported by the front axle rotate and the

third and seventh pivots are below the front wheel axis, and wherein the ninth and thirteenth pivots are above a rear wheel axis about which wheels supported by the rear axle rotate and the eleventh and fifteenth pivots are below the rear wheel axis.

9. A vehicle according to claim 7 wherein the first suspension comprises a first suspension bracket coupled to the first frame rail at a location forwardly of the front axle, the first suspension bracket extending downwardly from the first frame rail, and wherein the second and fourth pivots of the first suspension are carried by the first suspension bracket; and

wherein the second suspension comprises a second suspension bracket coupled to the second frame rail at a location forwardly of the front axle, the second suspension bracket extending downwardly from the second frame rail, and wherein the sixth and eighth pivots of the second suspension are carried by the second suspension bracket.

10. An apparatus according to claim 9 comprising a first intermediate bracket coupled to the first frame rail at a location rearwardly of the front axle and forwardly of the rear axle, the first intermediate bracket projecting downwardly from the first frame rail, a first tie member pivoted to the first intermediate bracket and having respective forward and rearward first tie member end portions, a first link pivoted to the first leaf spring rear end portion and to the forward end portion of the first tie member, a second link pivoted to the third leaf spring forward end portion and the rearward end portion of the first tie member, and wherein the apparatus further comprises a first rear bracket coupled to and projecting downwardly from the first frame rail at a location rearwardly of the rear axle, the third leaf spring rear end portion being coupled to the first rear bracket; and

a second intermediate bracket coupled to the second frame rail at a location rearwardly of the front axle and forwardly of the rear axle, the second intermediate

bracket projecting downwardly from the first frame rail, a second tie member pivoted to the second intermediate bracket and having respective forward and rearward end portions, a third link pivoted to the second leaf spring rear end portion and to the forward end portion of the second tie member, a fourth link pivoted to the fourth leaf spring forward end portion and to the rearward end portion of the second tie member, and wherein the apparatus further comprises a second rear bracket coupled to and projecting downwardly from the second frame rail at a location rearwardly of the rear axle, the fourth leaf spring rear end portion being coupled to the second rear bracket.

11. An apparatus according to claim 10 comprising a steering mechanism for steering the wheels of the tandem axles, the steering mechanism comprising first and second steering gears supported by an associated one of the first and second frame rails, a common mechanical coupling coupled to each of the steering gears and to a steering wheel of the vehicle whereby rotation of the steering wheel controls the operation of the first and second steering gears, first and second pitman arms, the first pitman arm being drivenly coupled to the first steering gear and the second pitman arm being drivenly connected to the second steering gear, first and second drag links each having respective first and second end portions, the first end portion of the first drag link being pivotally coupled to the first pitman arm and the first end portion of the second drag link being pivotally coupled to the second pitman arm, first and second steering arms coupled to the wheels to be steered, the second end portion of the first drag link being pivotally coupled to the first steering arm and the second end portion of the second drag link being pivotally coupled to the second steering arm, whereby rotation of the steering wheel in one direction drives the first and second steering gears to steer the wheels together.

12. An apparatus according to claim 11 wherein the mechanical coupling comprises a T-miter box.

13. An apparatus according to claim 12 in which the first and second steering gears comprise controlling steering gears, the apparatus further comprising first and second controlled steering gears coupled to the frame rail at the opposite side of the vehicle from the frame rail to which the first and second steering gears are mounted, a respective one of the first steering gears controlling the operation of a respective one of the controlled steering gears and the respective other of the first and second steering gears controlling the operation of the respective other of the controlled steering gears, each of the controlled steering gears being steerably connected to an associated steerable wheel of the vehicle such that the position of the controlled steering gear controls the steered position of the associated wheel.

14. A steering system for a vehicle having first and second tandem axles with steerable wheels, the first and second axles being suspended from first and second spaced apart elongated frame rails, the steering system comprising:

a first steering gear coupled to the first frame rail member, first steering linkage coupling the first steering gear to a first wheel on the first axle such that operation of the first steering gear in respective opposite directions steers the first wheel in respective opposite directions;

a second steering gear coupled to the first frame rail member, second steering linkage coupling the second steering gear to a second wheel on the second axle such that operation of the second steering gear in respective opposite directions steers the second wheel in respective opposite directions;

a T-miter box coupled to the first frame rail and having a first miter box input and first and second miter box output, the first miter box output being directly coupled to the first steering gear and the second miter box output being directly coupled to the second steering gear, the T-miter box operating the steering gears to steer the first and

second steering wheels together in response to a rotational input at the first miter box input;

a steering wheel coupled to the first miter box input, wherein rotation of the steering wheel in a first direction causes the first and second steering gears to be driven such that the first and second wheels are steered together in one direction and rotation of the steering wheel in a second direction opposite to the first direction causes the steering gears to be driven such that the first and second wheels are steered together in a direction opposite to said one direction.

15. An apparatus according to claim 14 in which the first frame rail is at the driver's side of the vehicle.

16. An apparatus according to claim 14 comprising third and fourth steering gears coupled to the second frame rail member, third steering linkage coupling the third steering gear to a third wheel on said one of the first and second axles such that operation of the third steering gear in respective opposite directions assist the steering of the third wheel in respective opposite directions, fourth steering linkage coupling the fourth steering gear to a fourth wheel on the other of said first and second axles other than said one of said first and second axles carrying the third wheel such that operation of the fourth steering gear in respective opposite directions assists the steering of the fourth wheel in respective opposite directions;

the first steering gear controlling the operation of one of the third and fourth steering gears such that the wheel having steering assisted by the operation of said one of the third and fourth steering gears is steered in the same direction as the first wheel is steered by the operation of the first steering gear, the second steering gear controlling the other of the third and fourth steering gears that is not controlled by the first steering gear such that the wheel having steering assisted by the operation of said

other of the third and fourth steering gears is steered in the same direction as the second wheel is steered by the operation of the second steering gear.

17. A method according to claim 16 wherein the first and second steering gears and T-miter box are mounted to the outboard side surface of the first frame rail member.

18. An apparatus according to claim 17 wherein the first and second steering gears are mounted to the outboard side surface of the first frame rail member at a location no lower than the lower edge of the first frame rail member.

19. An apparatus according to claim 18 wherein the third and fourth steering gears are mounted to the outboard side surface of the second frame rail member.

20. An apparatus according to claim 19 wherein the third and fourth steering gears are mounted to the outboard side surface of the second frame rail member at a location no lower than the lower edge of the second frame rail member.

21. A method according to claim 14 wherein the first and second steering gears and T-miter box are mounted to the outboard side surface of the first frame rail member.

22. An apparatus according to claim 21 wherein the first and second steering gears are mounted to the outboard side surface of the first frame rail member at a location no lower than the lower edge of the first frame rail member.

23. A suspension for suspending one end portion of an axle from a frame rail comprising:

a first suspension associated with the first end portion of the front axle and coupling the first end portion of the front axle to the first frame rail, the first suspension comprising a first leaf spring including a central portion overlying and pivotally coupled to the first end portion of the front axle for pivoting relative to the axle about a first leaf spring pivot, the first leaf spring also including first forward and first rear leaf spring end portions coupled to the first frame rail, a first control rod having a first end portion pivotally coupled to the first end portion of the front axle for pivoting about a first pivot which is below the first leaf spring pivot, the first control rod having a second end portion pivotally coupled to the first frame rail for pivoting about a second pivot, and a second control rod having a first end portion pivotally coupled to the first end portion of the front axle for pivoting about a third pivot which is below the first pivot, the second end portion of the second control rod being pivotally coupled to the first frame rail for pivoting about a fourth pivot.

24. A vehicle suspension according to claim 23 wherein the first pivot is above a front wheel axis about which a wheel carried by the first end portion of the front axle rotates and the third pivot is below the front wheel axis.

25. A vehicle suspension for suspending end portions of at least one transversely extending front axle from first and second spaced apart frame rails, the front axle supporting wheels for rotation about a wheel axis, said suspension comprising:

a respective leaf spring associated with each axle end portion and pivotally supporting the associated axle end portion for pivoting about a leaf spring pivot and relative to the associated leaf spring, and respective sets of parallel first and second control rods, each set of control rods being associated with a respective one of the axle

end portions, the first control rod of the set having an end portion pivotally coupled to the associated axle end portion at a location below the associated leaf spring pivot and below the wheel axis, the second control rod of the set having an end portion pivotally coupled to the associated axle end portion at a location below the associated leaf spring pivot and above the wheel axis.

26. A vehicle comprising:

leaf spring means pivotally coupled to a front axle and to frame rails of the vehicle for pivotally suspending the axle from the frame rails; and

control rod means pivotally coupled to the axle at locations below the spring means and respectively above and below an axis about which wheels supported by the axle rotate, the control rod means also being pivotally coupled to the frame rails.